looking ahead

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Nuclear Power And Industrialization

by Harrison Brown

(The following is a condensation of Dr. Harrison Brown's Introduction to the NPA report Regional Economic Development and Nuclear Power in India, by *Norman L. Gold—one in a series on Productive Uses of Nuclear Energy. Dr. Brown is Professor in the Department of Geological Sciences, California Institute of Technology, and is the author of* The Challenge of Man's Future.)

DURING the last 150 years the scientific-technological-industrial revolution has spread in turn from Western Europe to North America to Japan to the Soviet Union. In recent years the leaders of India and of China, as well as those of other regions of the world which at present possess primarily agrarian economies, have announced that industrialization is the major goal of their respective nations. Barring cataclysmic upheavals, it seems likely that these countries will eventually achieve their goals. Indeed, if humanity succeeds in avoiding a major catastrophe, such as a world-wide war in which hydrogen bombs are extensively used, it seems probable that industrialization is destined one day to embrace the entire world.

WHEN VIEWED in terms of a span of a single human generation, the high levels of per capita production and consumption which are characteristic of those areas of the world which are already industrialized will not—indeed probably cannot—be achieved by countries such as India and China quickly. But when viewed in the perspective of the time that has passed since coal was first linked with iron in England, the spread of industrialization throughout the presently underdeveloped areas of the world may well take place with breath-taking rapidity.

When we examine the huge quantities of materials which would be required for the industrialization of India we can easily appreciate the magnitude of the task that is involved in the industrial development of such a vast and heavily populated area. If the people of India were, by magic, to be brought overnight to a per capita level of production and

World Population Explosion

• In the 1930's and early 1940's, because of the long decline in birth rates in industrial countries, many experts thought that world population growth would soon slow down. Actually, the multiplication since 1950 has exceeded anything that has ever gone before, just as that between 1930 and 1950 exceeded previous rates. In other words . . . there has been a steady rise in the *rate* of human increase, until it is at present sufficient to double the earth's population every 42 years.
• If the present rate of increase should continue, the earth would hold nearly six billion in the year 2000 (when most of our children will still be living) and nearly thirteen billion by the year 2050 (when some of our grandchildren will still be living) . . . Almost all claims that the earth can support its future population assume that this future population will be between three and seven billion.

•

From an address by Dr. Kingsley Davis, U. S. Delegate to the UN Population Commission, to the International Industrial Development Conference, San Francisco, California, October 14, 1957.

consumption such as that which now exists in the United States, the Indian mining industry would have to extract from the earth a "capital" of more than 3 billion tons of iron, more than 50 million tons of copper, nearly 40 million tons of zinc, and more than 5 million tons of tin—to mention but a few of the many materials which would be required. These quantities would represent nearly 20 times the present total annual world-wide production of these metals. And, of course, the production of such vast quantities of materials would require the expenditure of enormous amounts of energy.

In order that a highly industrialized Indian society might be provided with adequate power, it would be necessary for it to consume fuels at a rate equivalent to burning nearly 3 billion tons of coal each year—a rate which would be somewhat greater than the present rate of coal production in the entire world, and nearly 100 times greater than the rate of coal production in India today. At such a rate of production, India's indicated reserves would last fewer than 15 years. Of course, such a rapid rate of exhaustion could not actually take place for some time in the future, but it is a factor which must eventually be reckoned with.

THE COAL RESOURCES of India, although important to her at the present time and although large when compared with her present rate of production, are small when viewed in time perspective on a per capita basis. This is likewise true of her water power potential. It seems clear that India's ultimate energy reserves are insufficient to permit her to negotiate successfully the industrial transition. This means that if she is to succeed with her plans for development, she must eventually shift from a dependence on coal, petroleum, and water power as sources of energy to a dependence on nuclear energy.

Barring a world disaster, this shift in energy resources—the shift from conventional sources to uranium or thorium—is inevitable. The question yet to be answered is—when will the shift take place? Clearly, the answer will depend on our assumptions concerning the rate at which India can be expected to industrialize and on our knowledge concerning her available energy resources.

Given a favorable political climate, a modest amount of technological, educational, and economic help from the West and the application of a reasonable amount of economic ingenuity, it seems likely that India can double her basic industrial capacity every 10 years. She may not be able to attain this ratio of growth for, perhaps, another 10 to 15 years. But there is ample precedent that leads us to believe such a rate of growth is possible, even under the handicap of relatively meager resources. Between 1913 and 1936, for example, the steel output in Japan doubled every five years, rising thirty-fold during that time despite the fact that practically all of the basic raw materials had to be imported.

INDIA HOPES to achieve a steel productivity of 4.5 million tons by 1960-61, and if thereafter she is able to maintain a 10-year doubling time, her productivity should approach 20 million tons by 1980, and approach 75 million tons by the turn of the next century. If all goes well, within another 50 years India's steel production might exceed the present rate of production in the United States of about 100 million tons annually. We can expect her demands for other materials to increase proportionately—so if her steel production reaches 100 million tons, her annual requirements for copper, for example, would reach about 2 million tons and her demand for lead would reach about the same level. Similarly, by that time her demands for energy could well exceed the equivalent of one billion tons of coal annually.

It should be pointed out, however, that even were India to achieve such high levels of productivity in another 50 years, the lot of the average person would not be an abundant one, either from the point of view of material possessions or of food. The economic lot of the average Indian would be roughly equivalent to that of the average Japanese in the decade preceding World War II, but he would be less well fed than was the average Japanese at that time. India has yet to feel the full impact upon her population growth of the widespread use of modern, inexpensive public health techniques. And when we translate the results which have been obtained in other and smaller agrarian areas to the Indian environment, it is difficult to see how her rate of population growth can be confined to much less than 2 percent per year over the next 50 years. This would mean that the goods produced 50 years hence would have to be divided among roughly one billion persons.

IN THE ABSENCE of some dramatic improvement in our understanding of how to spread the knowledge of modern agricultural techniques rapidly among large numbers of people, and in the absence of a dramatic lowering of birth rate, it seems unlikely that the people of India 50 years hence will be much better fed than are the people of India today. There is clearly considerable room

for increasing food production in India, provided there is sufficient industrial growth to permit the production and transportation of the necessary fertilizers and pesticides and to provide the necessary irrigation facilities. But it takes time to spread the knowledge of how to use these things properly, and it takes time to provide the framework within which the use of modern agricultural techniques becomes possible from the economic point of view. Agricultural productivity can be increased in India at a rate that is greater than 2 percent per year only with very great difficulty.

Mr. Gold has concluded, I believe correctly, that nuclear power applied in certain special situations can contribute to Indian economic development during the next 25 years, but that really widespread substitution of nuclear power for conventional power seems unlikely in this period. It seems to this writer, however, that it is just at Mr. Gold's point of departure that India will begin to have widespread need for nuclear power as a substitute for conventional thermal power.

The change in the world energy situation during the course of the next 25 years will undoubtedly have considerable effect upon India's energy picture in 1980. Some reputable petroleum geologists have suggested, for example, that by 1970 the United States may reach its peak of domestic oil production and that the peak of world production may be reached by 1985. No matter how we look at the world oil situation, competition for the contents of the earth's remaining reservoirs is destined to increase rapidly in intensity.

TO SUMMARIZE the available evidence concerning the long-range view of India's energy picture, the availability of energy is not likely to be a major bottleneck in Indian economic development. Between now and about 1980, nuclear energy will be utilized only on a limited scale for specialized projects in regions where other energy supplies can be obtained only with great difficulty. By about 1980, however, it seems likely that a substantial fraction of India's liquid fuels will be obtained from coal. In addition, by that time the ratio of coal reserves to production will have dropped to less than one-half the level which prevails in Japan and the United Kingdom today. Under the circumstances, it seems likely that after about 1980 the greater proportion of new electric power stations will be of the nuclear type, and coal will become increasingly a premium fuel reserved for specialized chemical uses.

One of the most important lessons to be learned from Mr. Gold's study is that nuclear energy is no magic panacea which will enable the poorer nations to improve their levels of living overnight. To be sure, in the long run the availability of nuclear power in India, as in other countries, will eventually mean the difference between success and failure. This conclusion is inescapable. But we must realize that most of the enormous problems encountered in the economic development of such areas are in no way lessened by the birth of the nuclear age. There is still the problem of creating capital. There are still the problems of education, of building industries and transportation systems; still the problem of public health and of increasing food production at a more rapid rate than has thus far been achieved. And there is the enormous problem of decreasing the rate of increase in the number of persons to be fed.

NEVERTHELESS, it seems clear that India will one day have real need for nuclear energy. In view of this, it would appear that now is none too early for her to work vigorously on a nuclear energy program, with particular emphasis being placed upon the training of men. If, by 1980, she is to have the trained manpower, the raw materials, and the experience which will permit her to expand a nuclear-electric industry on a very large scale, it will be necessary for her to start almost immediately laying the groundwork.

Already India, as the result of hard work, has surmounted numerous obstacles and has come a considerable distance not only in the field of nuclear energy but in the entire area of industrial development as well. Personal observation has convinced me that she will go much further, and will eventually take her place with the Western nations and with Japan as a major industrial power.

(Regional Economic Development and Nuclear Power in India, by Norman L. Gold, with an introduction by Harrison Brown, NPA series on the Productive Uses of Nuclear Energy, Washington, October 1957: xvi and 132 pp., $2.75.)

Luther Gulick Receives Award

NPA Trustee, International and Steering Committee member, Luther H. Gulick received the Society for Advancement of Management Life Membership Award at the Society's 1957 Annual Fall Conference in New York. Mr. Gulick, who is President of the Institute of Public Administration, was the 1955 recipient of the NPA Gold Medal Award for "outstanding contribution through planning to the betterment of human life."

Western World—
A New Magazine

A NEW monthly international magazine, dedicated to preserving and strengthening the Atlantic Community of Nations, is appearing simultaneously in Europe and in the United States in identical French and English editions. *Western World* concerns itself primarily with political, social, economic, and general cultural matters of interest to both sides of the Atlantic.

In the first six issues, some of the contributing authors and topics included: Paul-Henri Spaak, Secretary-General of NATO, on the future of NATO; Senator W. F. Knowland and Paul Van Zeeland on East-West relations; Andre Fontaine, diplomatic editor and head of the foreign affairs department of *Le Monde*, on disarmament; Adlai Stevenson and Paul Reynaud on American anti-colonialism; and Nelson A. Rockefeller on Latin America and the Western world.

Acting as an intercontinental forum, *Western World* will have American books reviewed by Europeans and European books reviewed by Americans.

Myron M. Cowen, former Ambassador to the Philippines, Australia, and Belgium, and NPA Counsel and International Committee member, represents the United States on the magazine's Board of Directors. Also on the Board is Floyd G. Blair, former vice-president of the First National City Bank of New York.

Sponsors for *Western World* representing the United States are: William J. Donovan, Major General of the U.S.A.R. and former Ambassador; Under Secretary of State and former Governor of Massachusetts, Christian Herter; Paul Hoffman, former head of ECA; former Governor of Illinois, Adlai Stevenson; Henry J. Heinz, industrialist; President of Columbia University, Grayson Kirk; and John McCloy, former U. S. High Commissioner to Germany and Director of Civil Defense of New York City. Selwyn Lloyd of England, Christian Pineau and Antoine Pinay of France, and Prince Bernhard of the Netherlands are among the sponsors from 14 other countries.

(*Western World*, Occident-Western World Company, Brussels, Belgium, 75¢ an issue, $6.00 per year.)

—The People of NPA—

Myron M. Cowen

NPA Counsel, Trustee and International Committee member, the Hon. Myron M. Cowen, has pursued a significant law and government service career. His first ambassadorial appointment was to Australia in 1948. While Ambassador to Australia, he was appointed representative of the United States to the fourth session of the Economic Commission for Asia and the Far East. From early 1949 until late 1951 he served as Ambassador to the Philippines, and in 1949, as the representative of the United States to the fifth session of the Economic Commission for Asia and the Far East. In 1951, he was appointed adviser on the U. S. delegation to the Conference for Conclusion and Signature of the Treaty of Peace with Japan. From late 1951 until May 1952, when he was appointed Ambassador to Belgium, he served in the Department of State as Consultant to the Secretary with the rank of Ambassador and as Special Assistant to the Secretary for Mutual Security Affairs. Mr. Cowen studied at Wofford College in South Carolina and after receiving an LL.B. degree from Drake University in Iowa in 1918, was admitted to the Iowa Bar. He practiced in Des Moines until 1926, when he became Commissioner on the U. S. Court of Claims. In 1933, he resigned from that Court to enter private law practice in Washington. He is a member of the Iowa, District of Columbia and American Bar Associations. Mr. Cowen has received two LL.D. degrees—one from Salem College of West Virginia in 1946, the other from the University of Melbourne, Australia, in 1949. Upon departing from the Philippines, he was awarded the Philippine Legion of Honor, Commander rank. Mr. Cowen now practices law in Washington.

An International Audience for

The World's Great Literature

UNTIL RECENTLY, published translations of a portion of the world's great literature has been unavailable because of lack of translators of certain languages, and publishers' fear of financial loss due to high publication costs. Books written in Arabic, Norwegian, Urdu, Punjabi, Thai, Korean, or Portuguese were hardly, if ever, published in England, the United States, France or Germany. And obversly, western classics translated into these languages have been unavailable.

Now, for the first time, English-speaking peoples will be able to read, for example, the sacred writings of the Sikhs translated from Punjabi, books of philosophy translated from Arabic, representative novels translated from Spanish and Japanese, historical essays translated from Persian, and other literary works of other lands and cultures. The extensive UNESCO project known as the "Translation of Representative Works Programme" is bringing national literature to an international audience.

THE PROJECT has already translated Western classics like *Don Quixote* into Arabic, and Arabic classics into French and English. Spanish and Portuguese classics have been translated into French, and with the help of the Organization of American States, into English. For example, the UNESCO translation of the classic *Martin Fierro* poem will introduce Martin Fierro, the adventuresome Argentine gaucho, to a French audience.

The Persian historical essay, *The History of the World Conqueror* by Juvaini, is now being translated into English, and other Asian language literature has been translated into Western languages. In 1956 classics from little-known linguistic regions of the U.S.S.R. were brought to the Western world, as well as anthologies of the written and oral literatures of Africa.

The project was initiated in 1948 to translate selected Eastern and Western classics, and in 1952 was extended to the translation of contemporary works best representing the literature of the countries selected. The purpose of the project is to create better understanding between Eastern and Western peoples. A competent board in each country supplies UNESCO with a list of representative literature. The lists are examined and supplemented by a committee of experts, appointed by the International Council for Philosophy and Humanistic Studies, which also recommends qualified translators and revisers to guarantee absolute accuracy and literary quality.

The translation of contemporary works, the project's most recent undertaking, includes seven series. One series each is being translated from Dutch, Greek, Japanese, Norwegian, and Persian into French, and one each from Japanese and Swedish into English. One Turkish book and five in various Asian languages are expected to be chosen for translation during the next two years. (*The Unesco Courier*, June 1957, No. 6, and *Unesco Chronicle*, June 1957, Vol. III, No. 7.)

Western Hemisphere Cooperation

AT THE FIRST meeting of the NPA Interamerican Research Committee, held October 5, 1957, at the Pan American Union in Washington, D. C., the Committee—composed of representatives of all elements of private enterprise throughout the Hemisphere—adopted the following objectives:

"The basic objective of this Committee is to make an effective contribution to raising the standards of living of the men, women and children of our countries. Our people must have better homes, better clothing and food, better education for their children. This means that the real income of our men and women must be improved. And the money which they earn must be trustworthy and dependable. Our people must have confidence that the purchasing power of their savings will not be wasted away by inflation. More goods and services must be made available. We must produce more, and our production must be of sound quality and reasonably priced.

"The Interamerican Research Committee approaches this objective with three convictions:

"First: That our achievements will be more swift and more enduring if we approach our problems within the framework of private enterprise. This means simply placing on the shoulders of our private citizens the greatest possible responsi-

bility for the achievement of our aims. They should bear this responsibility, for their reserves of capital, of experience, of technical knowledge and equipment far exceed those of government in every one of our countries.

"Second: We feel that our efforts will be more effective if we work constantly within the concept of an American community of states, a hemisphere comprised of kindred peoples, who must develop and progress as a single great community.

"Third: We can make our most useful contribution toward our objective if we have the full support of the overwhelming majority of our people. We shall, therefore, use every effective means to keep the citizens of all of our countries fully informed of our studies and conclusions."

(The Interamerican Research Committee, National Planning Association, 1957, 7 pp.)

NPA International Research Committee Meeting

Seated at the Conference table, beginning at the head and proceeding clockwise: **Eric Johnston**, Committee Chm., The Motion Picture Assoc. of America, Inc.; **Galo Plaza**, Committee Vice Chm. from Quito, Ecuador; **John Miller**, NPA Exec. Sec.; **Alberto Gainza Pas**, Editor, "La Prensa"; **Goar Mestre**, Pres., Circuito CMQ, S. A.; **Herschel D. Newsom**, Master, National Grange; **Fausto Rivera Cardoso**, Pres., Confederacao Nacional dos Trabalhadores no Comercio; **Serafino Romualdi**, Inter-American Rep., AFL-CIO; **Loyd A. Haskins**, Gen. Sec., International Federation of Petroleum Workers; **J. Wayne Reitz**, Pres., University of Florida; **L. A. Alden**, W. R. Grace & Co.; **Joseph W. Montgomery**, Vice Pres., United Fruit Company; **Antonio Mata**, Pres., Cerveceria Hondurena, S.A ; **Stacy May**, New York; **Eduardo Montealegre C.**, Gen. Mgr., Banco Nicaraguense; **Frank A. Besosa**, Vice Pres., Plaza Provision Company; **Enrique Alvarez Drews** of El Salvador; **Eduardo Saenz Garcia** of Saenz Ltda.; **Charles A. Meyer**, Vice Pres., Latin American Operations, Sears, Roebuck and Co.; **Luis Legorreta**, Vice Chm. of the Board, Banco Nacional de Mexico; **Charles J. Symington**, Chm. of the Board, The Symington-Gould Corporation; **Laird Bell** of Bell, Boyd, Marshall & Lloyd; **T. W. Schultz**, Chm., Dept. of Economics, University of Chicago; **Henry F. Holland** of Roberts & Holland; **Marcial Mora M.**, Santiago, Chile. Attending but not in picture: **Eugenio Mendoza** of Eugenio Mendoza & Cia., Venezuela.

Economic Developments in Europe

IT IS NOW possible to appraise the economic development in Europe in 1956. Continued expansion of industrial and agricultural production characterized economic developments in most countries in Europe during that year. However, the rate of expansion varied greatly.

According to the latest *United Nations Economic Survey of Europe,* industrial production in Western European countries rose five percent last year in contrast with increases of 10 percent annually during the preceding two years. In the United Kingdom and Denmark, industrial output actually declined below 1955 levels. Restrictive economic policies—which were in force in almost all Western European countries in an effort to combat price and wage increases and balance of payments difficulties—were largely responsible for the decline in the rate of industrial expansion.

Western Europe's trade balance as a whole continued to deteriorate despite a seven percent increase in exports, as imports rose even more rapidly. Western Germany was Europe's largest trade surplus nation; the United Kingdom, Western Europe's largest trade deficit nation. Both countries improved their trade balances in 1956 by a total of $1.2 billion. However, France experienced a large trade deficit of almost equal size, thereby reversing its small trade surplus in 1955 and causing a serious drain on that country's foreign exchange reserves. Thus, the net trade deficit for Europe as a whole remained at approximately the 1955 level.

In Eastern Europe, the general economic growth in 1956 which was indicated for the Soviet Union was not shared by the other Eastern European countries. The increase in agricultural output reported for the Soviet Union was the predominant feature of the year. Total grain production showed a 20 percent rise over 1955. Particularly significant was the expansion of production in Siberia and Kuzakhstan where state farm deliveries of grain were reported to have tripled over 1955.

Adverse weather conditions influenced the poorer showing of agriculture in other parts of Eastern Europe. In Bulgaria and Rumania agricultural production dropped five and 15 percent, respectively, below 1955 levels. Industrial output in the Soviet Union and in all Eastern European countries except Hungary are reported to have increased at rates varying from seven to 16 percent. In Hungary, industrial production fell 14 percent below 1955. *M. H.*

(U. N. Economic Survey of Europe in 1956, United Nations, Geneva: March 1957, 340 pp., $2.50.)

An ILO Manual

Work Studies and Productivity

WORK STUDY—the systematic and technical analysis of work activities as related to production methods—is covered in detail in a 1957 manual published by the International Labour Office.

According to the ILO manual, "work study acts like a surgeon's knife, laying bare the activities of a company and their functioning, good or bad, for all to see. It is a great 'shower-up' of people, and for this reason it must be handled, like the surgeon's knife, with skill and care."

The ILO manual points out that work study techniques can bring to light certain weaknesses of organization and operation, as well as introducing techniques by which management can raise productivity.

Work study, which has long been an important tool of management engineering in the United States, is defined in the ILO manual as the systematic approach for ensuring the best use of human and material resources of an organization, and for increasing productivity and thus, through general application, raising the standard of living.

THE MANUAL discusses in detail the two main interrelated techniques of work study—method study and work measurement—and contains comprehensive flow process and operator process charts, analysis sheets, flow and string diagrams, operator movement study sheets, samples of workplace layouts, simo charts, and examples of time-study boards and forms, plus many case examples.

Method study is concerned with developing and applying effective ways of doing work, work measurement in determining and reducing the time needed for carrying out the operations based on the method study. The techniques discussed in the manual have been widely and successfully applied in various countries. According to the manual, they are one of the factors responsible for high productivity in North America and Western Europe, and the ILO believes, can contribute to increasing productivity in lesser developed countries.

The work study techniques are effective in raising productivity, the manual says, because they are the most accurate means of setting standards of performance on which the planning and control of production depend. They are tools of investigation that management can apply everywhere, and which, the manual asserts, normally involve little capital expenditure on plants or equipment. Moreover, the savings that result from work study techniques continue as long as the operations continue in improved form.

The manual is divided into three major sections. The first section discusses causes of low productivity, and the management methods used to eliminate the causes. Two chapters in this section are devoted to the environment in which work studies should be undertaken. The importance of good human relations and working conditions as prerequisites to work studies is stressed.

The second and third sections present a detailed discussion of the main techniques of work study—what can be accomplished by them and how they should be conducted. For example, in the second section, the detailed coverage includes charting work processes; factory layout, and the development of new layout; materials handling, with an example of layout and handling of materials in an engineering factory; movement of workers in shops, and of workers and materials at the workplace.

The third section deals entirely with work measurement, and includes detailed coverage of the initial steps in making a time study; the compilation of time allowances, and the use of time standards.

The ILO work study manual is intended as a reference book for those inside and outside industry interested in work study techniques and application. Appendices include suggested readings in further refined work study techniques, and examples of work study appreciation courses for top and middle management.

(*Introduction to Work Study*, International Labour Office, Geneva: 1957, 349 pp., $3.50.)

Teacher Educator Aids

A new directory lists for the first time the availability of teacher educator aids obtainable from the legislative and executive branches of government, some independent agencies and multilateral international organizations. Included are: sources of news releases and publications, available speakers, demonstrations, and instructional materials. (Ruth L. Kemp, *Directory of Educational Aids*, Washington, D. C.: 1957, 84 pp.)

Christmas Gift Memberships

Business gifts can be a problem at Christmas time. An easy, and welcome solution, is a gift membership in the National Planning Association.

An Associate Membership at $5.00 will provide ten issues of *Looking Ahead* plus the privilege of a 25 percent discount on all NPA publications.

A Subscribing Membership at $10.00 will provide all planning pamphlets and special reports published during the year—plus *Looking Ahead*—plus the privilege of renting current social science books through the Social Sciences Library Service.

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Just send in the names and addresses of the persons you wish to receive gift memberships to: Membership Department, National Planning Association, 1606 New Hampshire Avenue, N.W., Washington 9, D. C. It is not necessary to send payment. We'll be delighted to bill you later.

U.S.A. in New Dimensions

AN upward trend in American productive power which gives a new perspective to our economic system is the subject of *U. S. A. in New Dimensions* by Thomas R. Carskadon, Associate Director of the Twentieth Century Fund, and George Soule. The report is based on the 1955 Twentieth Century Fund's 1,100 page study, *America's Needs and Resources: A New Survey*, by J. Frederic Dewhurst and associates.

The report estimates that, in another century, one 7-hour day will equal in production our present 40-hour week, and as early as 1960, the average work week may be as low as 37½ hours.

(*U. S. A. in New Dimensions*, Thomas R. Carskadon and George Soule, Twentieth Century Fund, New York: July 1957.)

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looking ahead

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